

*Exceptional service in the national interest*



*Congresswoman Michelle Lujan Grisham's*

# Water Innovation Summit

Session VII - Economic Development Opportunities

## Water and Economic Development

*Mike Hightower*

*Distinguished Member of the Technical Staff*

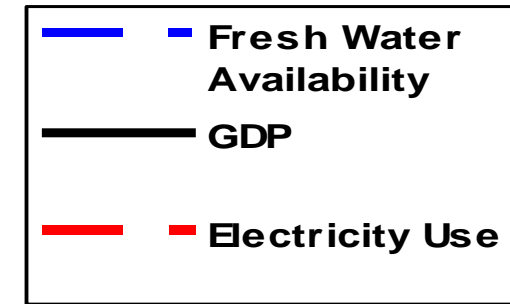
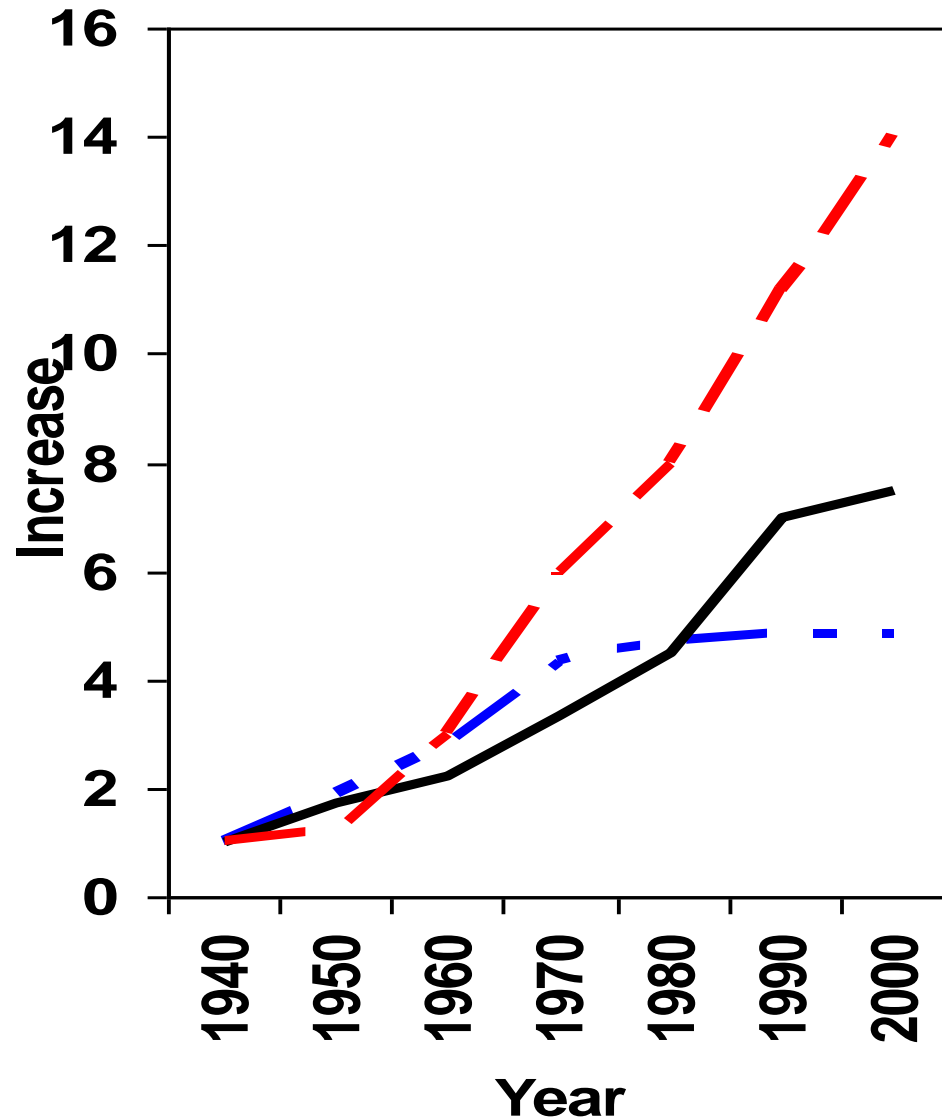
*Sandia National Laboratories*

*October 14, 2014*



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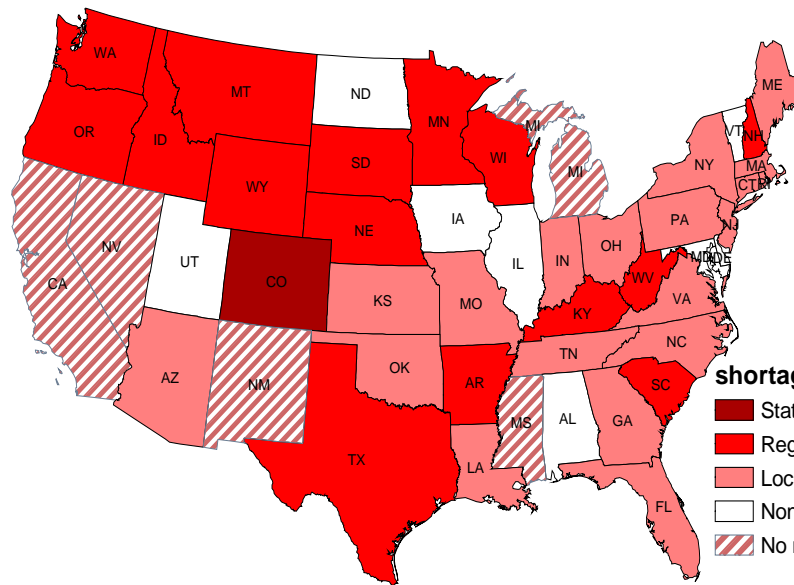
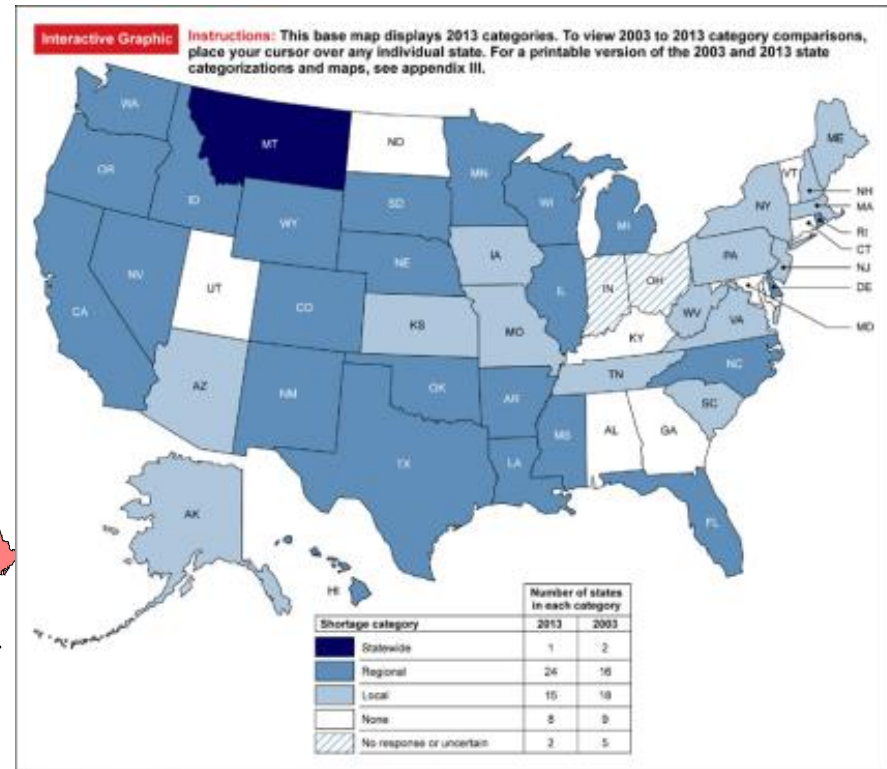
# Water More than Other Resources is the Major Driver for Economic Growth and Productivity



- Water for manufacturing processes
- Water for energy for manufacturing
- Domestic water supplies for workers
- Water for recreation

**“Water promises to be to the 21st century what oil was to the 20th century: the precious commodity that determines the wealth of nations.”**  
*Fortune Magazine, May 15, 2000*

# Growing Water Stress by State



GAO 2003

GAO 2013

# Within 10 years

Today one in five people live in areas of water stress.

This is expected to rise to two in three.

Demand for water is set to outstrip supply by 40%.

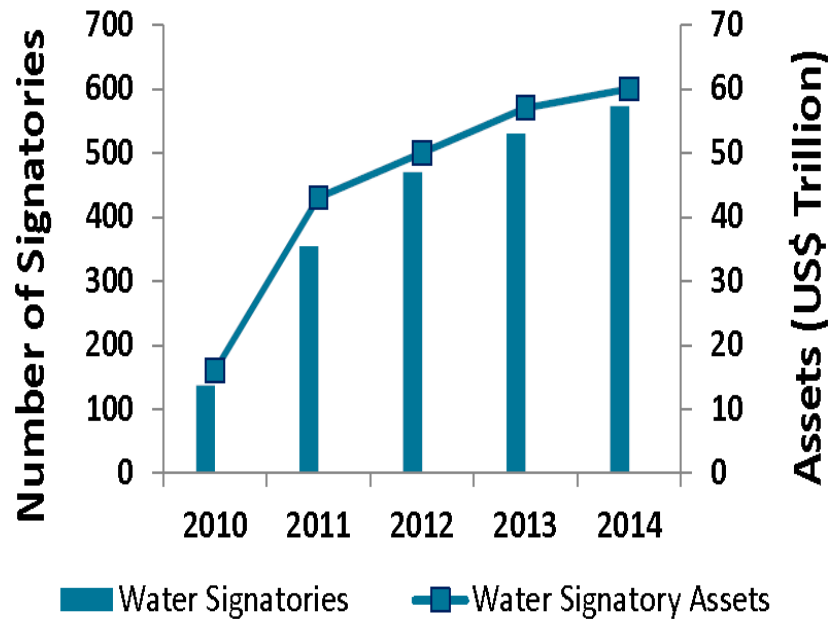
Business as usual water management will put at risk \$63trillion or 1.5 times today's entire global economy.

Water will have more rapid and unavoidable consequences for some businesses than carbon

Goldman Sachs

# Investor Interest In Water Risk Is Rising

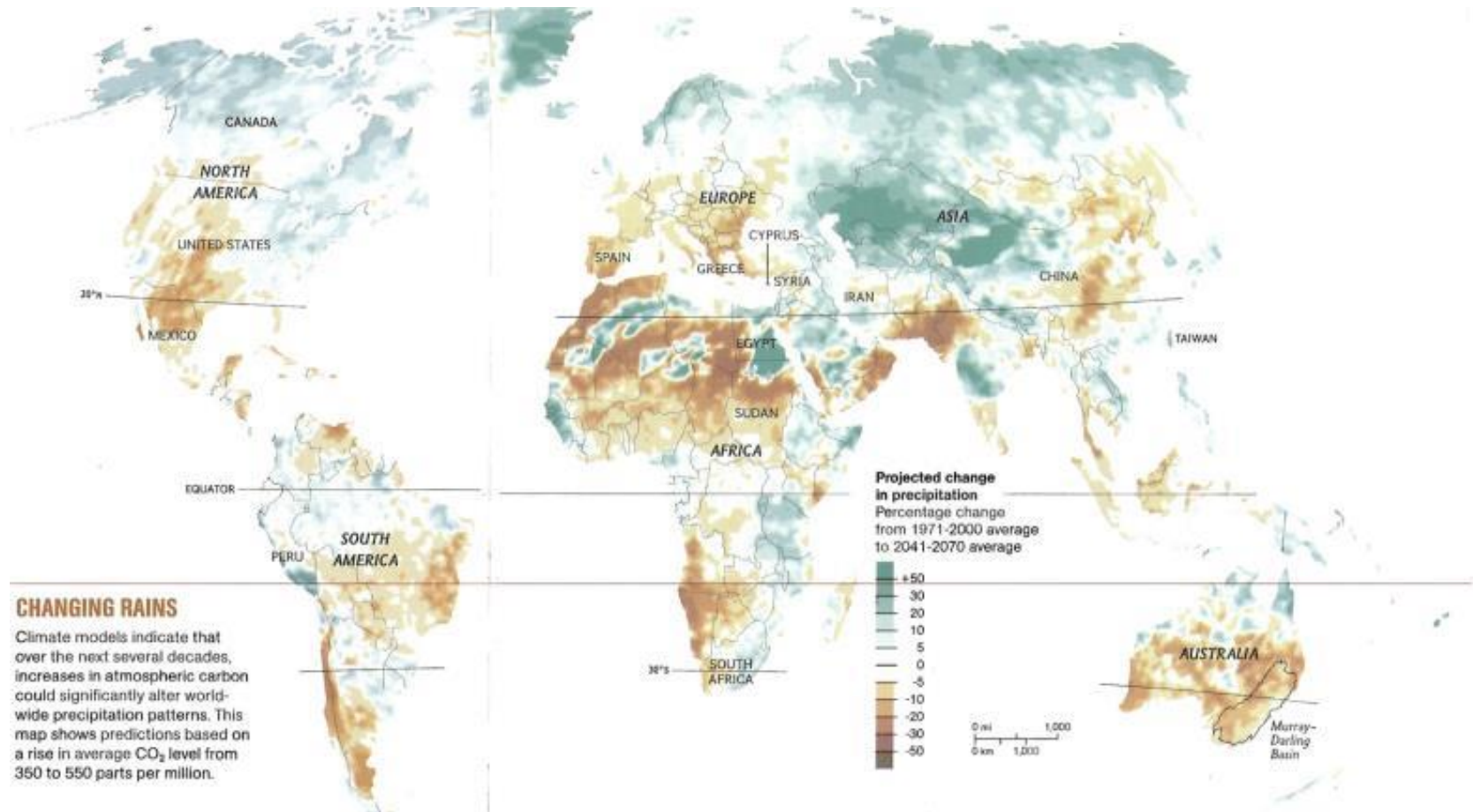
CDP Signatories & Signatory Assets: 2010 - 2014



“ Investors know how damaging inaction, inappropriate action or delaying interventions on water-related issues can be... The global economy will favor business that take a pro-active approach to water stewardship.”

- **Eurizon Capital**

# Climate Changes will Impact Precipitation, Evapotranspiration, and Water Availability



Nat. Geo. April 2009 from IPCC

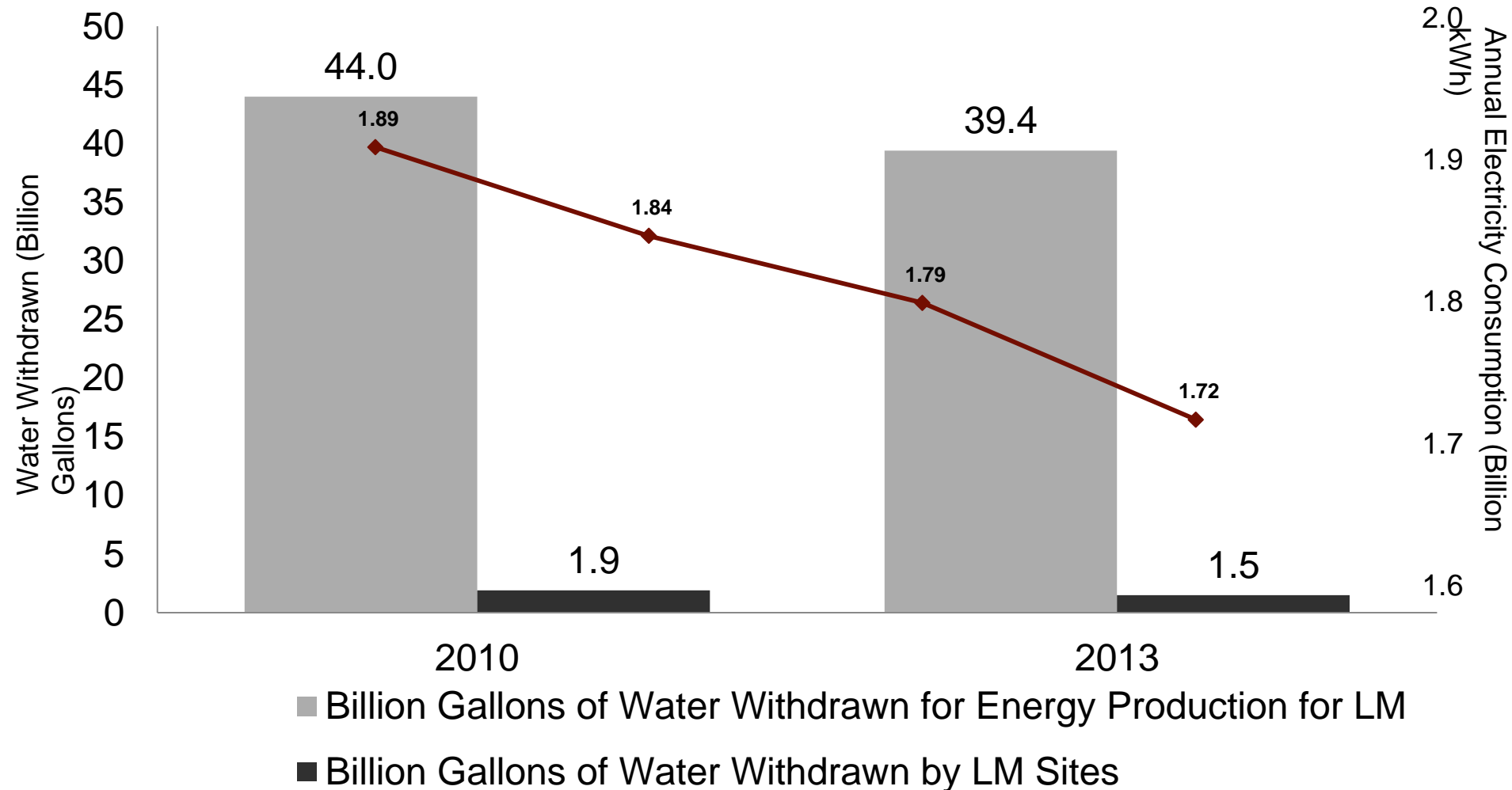
# Improving Economic Development Opportunities with Limited Fresh Water Resources

- **Create New Fresh Water Supplies**
  - Creative storm water management and storage
  - Water harvesting from mountain water sheds
- **Creative Water Reuse**
  - Require industrial water reuse – produced water, electric power plant cooling water, mining water, ag water returns, frac water, etc.
  - Require domestic waste water reuse
- **Use Brackish Water for New Supplies**
  - Require brackish water use as available for non-potable applications
- **Innovative Energy Infrastructure Improvements**
  - Utilize New Mexico's extensive energy resources
- **Embrace Public Private Partnerships**
  - All efforts will require significant capital, with ROI in 10-20 yrs

# Water Use and Consumption for Electric Power Generation

| Plant-type  | Cooling Process                                   | Water Use Intensity (gal/MWh <sub>e</sub> ) |             |             |
|---|---|---|-------------|-------------|
|   |   | Steam Condensing                            |             | Other Uses  |
|   |   | Withdrawal                                  | Consumption | Consumption |
| Fossil/ biomass steam turbine                     | Open-loop   | 20,000–50,000                               | ~200-300    | ~30         |
|   | Closed-loop                                       | 300–600                                     | 300–480     |             |
| Nuclear steam turbine                             | Open-loop   | 25,000–60,000                               | ~400        | ~30         |
|   | Closed-loop                                       | 500–1,100                                   | 400–720     |             |
| Natural Gas Combined-Cycle                        | Open-loop   | 7,500–20,000                                | 100         | 7–10        |
|   | Closed-loop                                       | 230   | 180         |             |
| Integrated Gasification Combined-Cycle            | Closed-loop                                       | 200   | 180         | 150         |
| Carbon sequestration for fossil energy generation | ~80% increase in water withdrawal and consumption |   |             |             |
| Geothermal Steam                                  | Closed-loop                                       | 2000  | 1050        | 50          |
| Concentrating Solar                               | Closed-loop                                       | 750   | 740         | 10          |
| Wind and Solar Photovoltaic                       | N/A   | 0   | 0           | 1-2         |

# Industrial Water Footprint – Direct and Indirect



# Thanks

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